Joris van Rossum

A Case Reopened: Teleology and its Consequences for the Units of Selection Discussion

Keywords. Darwinism, naturalism, genic selectionism, teleology, teleonomy, units of selection

Abstract. *Darwinian explanations for teleology are often imprecise, and justify the occurrence of teleological features by referring to natural selection in a vague and unspecified sense. In this paper, the Darwinian account for teleology is further analyzed. It is argued that in theory only a specific form of teleology – teleology that is caused by* and *directed towards the preservation of the genetic program – can be explained in a naturalistic way by employing Darwin's theory of natural selection. This observation links teleology with the units of selection discussion, as for both discussions the end-direction of teleological processes and behavior is of elementary importance. According to Dawkins' analysis, the unit of selection is an active germ-like replicator with a sufficient degree of longevity-fecundity-copying fidelity. From the teleological point of view, the unit of selection should additionally incorporate*

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the genetic program in order to naturalize teleology. It is shown that within sexually reproducing species these two requirements cannot be met. Dawkins' concept of genic selectionism cannot be maintained without violating the naturalistic claims on teleology, and none of the other frequently proposed unit of selection candidates can adequately meet the demands as developed by Dawkins and those developed in the light of teleology.

1. INTRODUCTION

In this paper, the term teleology refers to the existence of teleological processes and behavior in living beings. In a naturalistic context, these properties call for an explanation. Rejecting all finalistic, dualistic and vitalistic claims on the occurrence of teleological phenomena, naturalism is still left with the question how the world ends up filled with objects that seem to falsify the claim that everything in the universe is the result of the free play of physical forces to which no goal, purpose or specific direction can be attributed. As Mayr remarked, "no discussion of causality is complete which does not come to grips with the problem of teleology" (Mayr [1988a], p. 29).

There is general consensus among biologists and philosophers on the fact that Darwin solved the epistemological conflict between naturalism and teleology. Natural selection is the key to the mystery, and the remedy from all vitalistic, dualistic and finalistic claims on the natural world. Contemporary biology maintains that natural selection can give a naturalistic account for the existence of teleological features of living beings by proposing a causal mechanism for their origin.

The decisiveness, however, with which scientists claim that Darwin incorporated teleology in a naturalistic framework often does not correspond to the effort taken to elucidate it. As George C. Williams noted, often natural selection does little more than to provide "a vague aura of validity to conclusions on adaptive evolution and to enable a biologist to refer to goal-directed activities without descending into teleology"[1] (Williams [1966], p. 20). In

[1] That is, any non-naturalistic account for them. In literature, teleology is often automatically associated with non-naturalistic notions.

this paper I will analyze the received Darwinian explanation for teleology by examining Ernst Mayr's account, which is a good representation of the general view among Darwinists. It is shown that Mayr's explanation remains imprecise in the sense that he explains teleological features by simply referring to 'fitness', despite the fact that this is an ambiguous term that can have various meanings (Dawkins [1982]).

Based on these observations and objections, I will work out a more precise description of those teleological processes and behavior that are explainable and understandable in a naturalistic context. This description can be seen as all those necessary requirements that entities that exhibit teleology should meet in order to make these features explainable. The next step will be to investigate whether living beings actually meet these requirements, i.e. whether the teleology found in nature can be explained. This will be done based on the units of selection discussion, which will be shown to be more closely related to teleology than assumed up till now.

2. TELEOLOGY AND DARWINISM

One of the philosophers who dealt with teleology extensively is Ernst Mayr. Fundamental in Mayr's explanation is the distinction between proximate and ultimate causes, both crucial in the causal understanding of teleology. Proximate causes are the domain of functional biology, explaining the processes of living beings in a physicochemical way. There is a causal chain leading from the information stored in the genetic code to the construction of the organism, whose executive structures lead to the goal-directed processes and behavior of living beings. Mayr used the term 'teleonomy' to refer to teleology that is in line with the above-sketched explanation. Those processes are called teleonomic – and thus causally explainable – that owe their teleological characteristics to the operation of a program (Mayr [1988a]). In living beings, this program is the genetic code, the genotype, which constitutes a template for the development of the organism.

Still, teleonomy explains teleology only partly. The introduction of the genetic program as the cause of teleological behavior

adds an element that needs to be explained, namely the existence of the genetic program itself. In Mayr's terminology, this is the domain of the ultimate causes for teleology, dealing with the history of programs and the laws that control their changes. The theory of evolution by natural selection is introduced as a mechanism that explains the evolution, and through this the existence of programs that lead to teleonomic processes and behavior.

While dealing at length with the proximate causes of teleology, Mayr's explanation in relation to the ultimate causes remains rather vague. In precisely what sense the evolutionary theory explains the existence of these programs remains to a great extent unelaborated. In his paper "Cause and Effect in Biology" he states:

> Natural selection does its best to favor the production of codes guaranteeing behavior that increases fitness (Mayr [1988a], p. 30).

In "The Multiple Meanings of Teleological", Mayr argues that "all teleonomic behavior [...] depends on the existence of some end point, goal or terminus which is foreseen in the program that regulates the behavior", this end-point being for example "a structure, a physiological function, the attainment of a new geographical position or a consummatory [...] act in behavior" (Mayr [1988b], p. 45). Then he continues:

> Each particular program is the result of natural selection, constantly adjusted by the selective value of the achieved end point (Mayr [1988b], p. 45).

When Mayr is arguing that natural selection favors the production of codes, he does not suggest that selection itself is the creative force *per se* behind their production. In his paper "Basic Concepts of Evolutionary Biology" he claims that Darwin's theory is in a way dualistic, in the sense that it provides a two-factor explanation. The first factor is genetic variability, which is "entirely a matter of chance, whether it is produced by mutation, recombination, or by whatever other mechanism" (Mayr [1976], p. 9). These mechanisms, then, produce the entities exhibiting variation on which natural selection can work. The second factor is the process of selection. The selective value of the genetic code, explaining its

preservation, is the fitness that results from the achieved end-point that is foreseen in the genetic code.

The aspect of the explanation of the ultimate causes for teleology that remains vague and insufficient is an exact account of the achieved end-points that give a selective advantage. When Mayr is giving examples of teleonomic features, he refers to the fitness that these features produce in a vernacular, general sense:

> A behavior program that guarantees instantaneous correct reaction to a potential food source, to a potential enemy, or to a potential mate will certainly give greater fitness in the Darwinian sense than a program that lacks these properties (Mayr [1988a], pp. 30, 31).

'Fitness', however, is a vague and confusing word. Dawkins alone summed up 5 different meanings that have been assigned to the term (Dawkins [1982]). What is, among others, left open with Mayr's explanation is exactly *whose* fitness the genetic programs should affect in order to explain their existence: fitness could for example relate to the fitness of the specific trait, the fitness of the individual, or the fitness of a gene, something which is not further elaborated. What is especially missing in Mayr's description of achieved end-points is a reference to the genetic program itself, despite the elementary role it plays in his explanation of teleology.

This shortcoming, i.e. the lack of an account what end-states of teleological features make these features themselves explainable, can also be found in the work of other influential authors. David Hull, for example, states that the evolutionary theory determines the ultimate goal-states of teleological systems by restricting their possible end-states (Hull [1974]). From a physiological point of view, many possible teleological systems can exist, but evolutionary biology can account for the existence of a certain class of these systems in nature. However, Hull does not follow his argumentation by precisely defining what these possible end-states are, i.e. which possible teleological systems evolutionary biology can account for, and which not.

In light of these objections, in the next paragraph I will give a more comprehensive account for the occurrence of teleological processes and behavior in natural phenomena, stating precisely which types of teleological processes and behavior can be explained

within a naturalistic context, without the use of controversial or ambiguous terms such as fitness.

3. AN EXACT DESCRIPTION: TELEOLOGY, THE THEORY OF NATURAL SELECTION AND THE UNITS OF SELECTION

A fundamental pillar of the naturalistic method is that no goal, purpose or specific direction can be attributed to the forces of nature. We cannot assume that *in themselves* physical forces have any tendency towards teleological behavior, or towards the creation of entities that exhibit this behavior. It is only to structures and entities that have been molded under the mechanism of natural selection – adaptations – that this goal-direction can be attributed. From these assumptions, the following can be deduced:

The name of the game in natural selection is survival. Natural selection deals with the differential survival of the fit and those that do not have what it takes to survive. Therefore, adaptations have been developed and retained by virtue of their contribution to the preservation of the surviving entity – let us call it X. Thus, as a rule we can say that all teleological processes and behavior are, as their *raison d'être,* directed to the preservation of X, which will be defined as the end-direction, or ultimate goal (Ayala [1970]) of these processes and behavior.

Teleological processes and behavior have their origin in the genetic program. Since naturalism implies that we cannot assume natural forces being directed to anything, let alone to the creation of genetic programs, this genetic program has to be included in X in order to be actively preserved. If the genetic program was not included in X, there would be no force directed to its preservation, so that its perishing would be inevitable. Hence, the only genetic programs that survive (i.e. are fit) are those that are directed to their own preservation, and genetic programs can *only survive* due to the teleological processes and behavior that originates from that same genetic program.

Moreover, since the only processes that we can assume to be goal-directed are processes directed at preservation, creation has to be blind and purposeless. Thus, only undirected physical forces

can account for the *creation* of genetic programs, although they can be teleologically *preserved*.

Consequently, naturalism and Darwin's theory of natural selection *a priori* imply that teleology that can be accounted for in a naturalistic way is of the following nature: (1) the genetic program explains the occurrence of teleological processes and behavior (teleonomy), (2) the teleological processes and behavior in their turn explain the *preservation* of the genetic program as they are directed towards the preservation of X which incorporates the genetic program, although (3) genetic programs are ultimately *created* and *altered* (genetic variation) by the undirected physical forces of nature, such as by mutations and recombination.

From the origin of Darwin's theory of natural selection, scientific opinions about the level on which selection works – what X is – have varied from the individual to the species, and all the way down to the gene. Darwin himself adhered to the idea of the individual as the unit for which adaptations exist (Brandon [1984]). In the middle of the 20th century, the pendulum swung to groups or species, with biologists like Wynne-Edwards claiming that groups or species are the target of selection. In the 1960's and 1970's, Williams and Dawkins developed theoretical objections against the notions of both individual and group selection. Their approach towards the problem was unique in that they started with a theoretical, conceptional analysis of the subject before considering potential candidates. The character of this approach prompted Hull to call it an act of metaphysics, in the sense that "(Dawkins) provides a general analysis of replicators and leaves it a separate issue the question which entities in the empirical world happen to have the requisite characteristics" (Hull [1984], p. 150). Based on this approach, Dawkins claims that the unit of selection, independent of the level on which it will be actually found, is foremost an "active germ-like replicator with a sufficient degree of longevity-fecundity-copying fidelity" (Dawkins [1982]). Dawkins' analysis also includes the concept of vehicle, which he defines as "any relatively discrete entity, such as an individual organism, which houses replicators, and which can be regarded as a machine programmed to preserve and propagate the replicators that ride inside it"

(Dawkins [1982], p. 302). The vehicle is an integrated and coherent instrument for replicator preservation, not that which is preserved, but that which preserves. Moreover, the vehicle is not a continuous, 'surviving' entity like the replicator, but a temporary, transient unit.

The units of selection discussion is closely related to the naturalistic explanation of teleology. By definition, the unit of selection is that level or unit within the hierarchy of life adaptations exist for the good of, that is, the level that is actively preserved through adaptations. Since it was concluded that this end-direction of teleological processes and features is crucial in the naturalistic account of teleology as well (the genetic program should be included in the level that is actively preserved in order to naturalize teleology), the unit of selection discussion can not be seen independent of the discussion about teleology. After all, evolution is not the only aspect of living beings that needs to be explained: an account for their teleological features should be provided as well. I will therefore expand the 'metaphysics' of Dawkins by processing all that has been said about teleology in his description of a suitable unit of selection candidate.

Thus to Dawkins' demands concerning the unit of selection should be added the demands derived from the naturalistic explanation of teleology in nature. Besides being an active, germ-like replicator with a sufficient degree of longevity-fecundity-copying fidelity, the replicator should also include the genetic program underlying and defining all teleological processes and behavior (teleonomy), these processes and behavior being directed towards the preservation of the unit of selection – or replicator – itself. If the preservation of the genetic program that underlies and defines all teleological processes and behavior (teleonomy) executed by vehicle (or organism) A in generation T was not included in the direction of all teleological processes and behavior as executed by vehicle A-1 in generation T-1, i.e. not included in the unit of selection X, then we would have to assume either (1) other forces outside those molded under the mechanism of natural selection or (2) forces not belonging to entity X, having created the genetic program. However, based on the premises of naturalism and the

theory of natural selection, we may not assume these forces or mechanisms to be present. With the same argument, we have to assume that all teleological processes and behavior operative in vehicle A in generation T are directed towards preservation of the unit of selection X which includes the genetic program that forms the basis of all teleological processes and behavior as executed by vehicle A+1 in generation T+1. Using Dawkins' abbreviation of the unit of selection as the "active, germ-like replicator with a sufficient degree of longevity-fecundity-copying fidelity" (Dawkins [1982]), we should extend this definition as follows: The unit of selection is that level within the organization that is an active, germ-like replicator with a sufficient degree of longevity-fecundity-copying fidelity and which *includes the genetic program that forms the basis of the teleological processes and behavior* as executed by the vehicle. Or, in short, a replicator that encompasses the genetic program.

The aspect of the selective theory that is of *relevance for teleology* – and which Mayr fails to point out – is that natural selection first and foremost produces, and evolution above all deals with programs whose teleological processes are directed towards the preservation of the genetic program itself ('self-preservation'). In a teleological context, fitness primarily relates to the capacity to self-preserve. The *units of selection* discussion deals with a separate aspect of the theory of natural selection, namely the possibilities of organisms to evolve through the accumulation of beneficial mutations and to branch out into different species.[2] However, the teleological features of living beings demand that this evolution first and foremost takes place between organisms whose genetic programs are essentially directed to their own preservation.

Dawkins followed his theoretical analysis by an empirical investigation. After determining the characteristics of the unit of selection, the eye is turned to the empirical world to determine which

[2] Note that for example *replication*, which is an elementary concept in the units of selection discussion in the explanation of evolution, plays no role in the teleology discussion. Genetic programs do not have to replicate in order to be teleological, but replication is a prerequisite for evolution.

levels or units correspond to the theoretical characteristics of the unit of selection. Following Dawkins' analysis, in asexual reproduction the entire genome could be the unit of selection. In those cases in which no crossover occurs, entire chromosomes might serve as units of selection, and adaptations could be seen as being for the good of the preservation of the chromosome. However, in sexually reproducing organisms the gene is the only candidate that can serve as a unit of selection. It is neither the organism, nor any other candidate except the small genetic fragment that qualifies as a replicator, and through this, as the unit of selection:

> Genes are replicators; organisms and groups of organisms are best not regarded as replicators; they are vehicles in which replicators travel about (Dawkins [1982], p. 82).

Besides being a replicator with a sufficient degree of longevity-fecundity-copying fidelity, from the teleological point of view the level on which selection works should also be that level which incorporates the (genetic) program that gives rise to the teleological behavior (teleonomy). My next step is therefore to determine whether, in case of sexually reproducing organisms, preserving the gene also encompasses or guarantees the preservation of the genetic program.

4. GENES, GENOTYPE AND TELEONOMY

The task in this section is to determine the exact relationship between genes, genotype and the genetic program in a teleological context. It is clear that genes do in fact constitute the informational backbone of teleological processes: there is a causal chain leading from the information stored in the genetic code to the construction of the vehicle, whose executive structures lead to the goal-directed processes and behavior of living beings. Moreover, genes are discrete units within the genetic program: genes store the information of the basic units within proteins. It is also clear that besides the genetic information there is no other source of information defining the vehicle. All the genetic information is present in the gene-pool, consisting of the complete genetic information

of a specific population. What is crucial in the relation to teleology, however, is that teleological behavior arises only in the *specific combination and arrangement* of genes within an organism. If we were able to randomly combine and arrange genes from a gene pool on chromosomes, and randomly combine chromosomes in a cell, we would obtain chaos, and certainly not an astonishingly complex, perfectly operating organism. Therefore, it is not only in the genes *per se*, but in the highly specific combination and arrangement of genes that we obtain vehicles with these amazing teleological processes and behavior, and it is only in this context where genes have a teleological meaning. Dawkins realized this, although this fact did not convince him that the concept of genic selectionism needs to be abandoned. Genes get their meaning and significance only within the genetic background in which they operate.

Dawkins proposed two selective models to explain how these harmonious combinations of genes come about. The first concerns selection on the level of these higher-order units, where harmonious units are favored in natural selection against disharmonious units. The second model refers to selection at the lower levels, which he called frequency-dependent selection:

> Components within a population are favoured by selection if they happen to interact harmoniously with the other components that happen to be frequent in the population. In a population dominated by millers, individual farmers prosper, while in a population dominated by farmers it pays to be a miller (Dawkins [1982], p. 240).

The same principle holds for genes:

> The genotype may be a 'physiological team', but we do not have to believe that that team was necessarily selected as a harmonious unit in comparison with less harmonious rivals units. Rather, each gene was selected because it prospered in its environment, and its environment necessarily included the other genes which were simultaneously prospering in the gene-pool. Genes with complimentary 'skills' prosper in each others' presence (Dawkins [1982], p. 240).

Dawkins tried to show how individual genes can be the unit of selection despite the fact that their functioning relies heavily on

their cooperation with, and the workings of, other genes. He described the 'other' genes as the environment in which individual genes are selected based on their value as a member of the team. But the other genes that form the environment in which individual genes operate, is not so much the gene pool, but the genes specifically arranged and combined within the vehicle, the individual organism. And this combination and arrangement is not a steady, constant environment in the background of which natural selection can do its work, rather this environment is created, with every generation, through the elaborate and ingenious teleological processes and behavior of living beings under the mechanism of natural selection itself. So while Dawkins employed the genetic environment to establish his genic selection standpoint, it is exactly the genetic environment, giving rise to teleological processes and behavior, which needs to be explained through natural selection.

I have earlier shown that natural selection is the only mechanism under which we can assume teleology to appear, and that preservation is the only direction that can be ascribed to teleological processes and behavior. This means that (1) the specific arrangement and combination of genes within a genotype cannot *directly* be shaped by forces outside those molded under the mechanism of natural selection, and (2) can, through these forces, only mean the preservation of a certain combination and arrangement of genes that have been molded by a long process of creation (e.g. mutation) and selection. With the gene as the unit of selection, teleology would be exclusively directed to the preservation of the gene. Still, we see that in every generation a new and unique genotype, consisting of thousands of genes ordered in a specific arrangement, is created through teleological processes and behavior in the form of sexual reproduction. And this creation can thus not be accounted for: with the gene as the unit of selection, all teleological processes and behavior are exclusively directed to the preservation of the gene, and cannot account for the creation of something that is of a higher level than the gene itself. This leads to the conclusion that from the point of view of teleology, the gene cannot be the unit of selection.

If we look at the other levels within the hierarchy of life that were labeled as possible units of selection, we also find the difficulty to combine the requirements from Dawkins with those laid down in this paper. The fact that genes do not work independently of each other, but are part of a larger, integrated interacting system, could lead to the suggestion that the organism is the unit of selection. But, as Dawkins rightly claimed, the organism – and the same holds for groups – is not a stable unit, something that survives throughout the generations, let alone that it is actively preserved. Therefore, it falls out as candidate for being the unit of selection:

> Genetically speaking, individuals and groups are like clouds in the sky or dust – storms in the desert. They are temporary aggregations or federations. They are not stable through evolutionary time (Dawkins [1976], p. 36).

What about species? The first objection to group selection on the level of the species I share with Dawkins. Species, indeed, are hard to conceive as replicators. And without being a replicator, it is hard to imagine how this unit could have evolved through the accumulation of beneficial mutations. Another reason for rejecting the species as a unit of selection is derived from the point of view of teleology. The gene pool is, like the individual gene, not identical with the genetic program. It is only through the specific combinations and arrangement of a selection of genes from the gene pool *within the organism* that teleological processes and behavior arise. So we might say that species are preserved through the teleological activities within organisms (in contrary to organisms which are not preserved, but created), the species, or gene pool, is not identical with the genetic program.

The attempt to reconcile the demands created by Dawkins and those constructed in light of teleology in various levels within the biological organization is summarized in table 1.

	Does it replicate?	*Is it preserved?*	*Does it encompass the genetic program?*
Gene	Yes	Yes	No
Individual	No	No	Yes
Groups	No	No	No
Species	No	Yes	No

Table 1 – Candidates for the unit of selection in sexually reproducing species, together with a summary of the most important requirements, derived from Dawkins' analysis of the replicator and the naturalistic account for teleology. All requirements have to be met in order to make the candidate a suitable unit of selection.

5. ALTERNATIVE VIEW: JACQUES MONOD

Earlier in this paper I claimed that many biologists dealt with teleology in a vague and incomplete way. An exception is the French biologist Jacques Monod, who dealt with the topic at length in his work 'Chance and Necessity'. The emphasis he placed on this subject is reflected by his claim that the teleonomic properties of living beings challenge one of the basic postulates of modern science:

> Objectivity [...] obliges us to recognize the teleonomic character of living organisms, to admit that in their structure and performance they act projectively – realize and pursue a purpose. Here therefore, at least in appearance, lies a profound epistemological contradiction. In fact the central problem of biology lies with this very contradiction, which, if it is only apparent, must be resolved; or else proven to be utterly insoluble, if that should turn out indeed to be the case (Monod [1972], pp. 21-22).

Monod argued that the central notion within the solution to the problem of teleology is the relation between *teleonomy* and *invariant reproduction*. Invariant reproduction is the ability of living beings to reproduce and to transmit *ne varietur* (unaltered) the information corresponding to their own structure. The information that stands at the basis of all teleological processes and behavior by serving as a blueprint for the organizational scheme of the individual, is preserved intact from one generation to the next one:

> All the functional adaptations in living beings, like all the artifacts they produce, fulfill particular projects which may be seen as so many aspects or fragments of a unique primary project, which is the preservation and multiplication of the species.
> To be more precise, we shall arbitrarily choose to define the essential teleonomic project as consisting in the transmission from generation to generation of the invariance content characteristic of the species. All the structures, all the performances, all the activities contributing to the success of the essential project will hence be called 'teleonomic' (Monod [1972], p. 14).

What Monod described here is essentially the same as what I concluded earlier as the necessary requirements of living beings to explain teleology in a naturalistic way. The teleological processes and behavior are directed to the preservation of the genetic program (what Monod describes as the invariance content of the species), this genetic program itself being the cause for teleological processes. The aspect of Monod's argument that differs from the conclusions of this paper is, however, not of theoretical nature, but of empirical. Living beings do not behave the way Monod described. For him, species are like giant replicators, being the unit that is multiplied and preserved through the teleonomic processes and behavior, and whose content is transmitted *ne varietur* from generation to generation. However, the species is not a replicator, the gene is. Also, it is not the species' invariant content that is transmitted from generation to generation, but a selection of the gene pool of the species within individuals. Moreover, only the genetic content *within individuals* gives rise to teleology, not the genetic content of the species as a whole.

If living beings did behave the way Monod described, i.e. if living beings had a fixed genetic program that was preserved and multiplied *ne varietur* from generation to generation, then indeed we had found the solution to the 'problem of teleology'. However, Monod mixed up and combined the *invariant* character of the species, with the *multiplying* character of genes and *teleological* character of individuals. But the fact is that – at least in sexually reproducing species – it is not possible to combine these three elements.

6. CONCLUSION

Based on the incompleteness of earlier Darwinian accounts for the existence of teleological processes and behavior, I have constructed general requirements that should be met to make these features comprehensible in a naturalistic way. An important role is played by the end-direction of teleological processes and behavior, as the genetic program that gives rise to teleology should be incorporated within this end-direction. This same level is essential for the units of selection discussion, which is not dealing explicitly with teleology, but with the possibility of organisms to evolve through the accumulation of beneficial mutations. Until this day, this discussion has been going on within its own, biological context. However, I have indicated that teleology, and the attempt to explain this phenomenon in a naturalistic way, creates additional demands for this unit, and thus transcends its relevance from an exclusive biological to a philosophical level.[3] The unit of selection cannot just be a replicator with a sufficient degree of longevity-fecundity-copying fidelity; it should additionally incorporate the genetic program that gives rise to teleology. I have shown that within the biological hierarchy of life, it is not possible to find a level that satisfies both the demands created in light of teleology and those in light of the units of selection discussion. The gene, which is the only suitable candidate based on the unit of selection discussion, cannot be maintained without violating the demands created in order to arrive at a naturalistic account for teleology, and none of the other frequently proposed unit of selection candidates can come to grips with the demands as developed by Dawkins and those developed in the light of teleology. This means that Darwin's theory of natural selection cannot account for both evolution and teleology within a naturalistic framework, or to be more precise, that the theory of evolution by natural selection cannot be maintained without presupposing a teleology that cannot

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[3] This contrary to Dennet's remark, that however the outcome of the units of selection discussion, Darwinism will still be standing strong (Dennet [1995]). The unit of selection controversy is not only relevant to biology alone, but its relevance stretches out to the Darwinian and naturalistic method in general.

be accounted for in a naturalistic way.

Department of Philosophy, University of Nijmegen, P.O. Box 9103, 6500 HD Nijmegen, The Netherlands

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Joris van Rossum

UN CASO RIAPERTO: LA TELEOLOGIA E IL SUO RUOLO NELLA DISCUSSIONE SULLE UNITÀ DI SELEZIONE

Riassunto

Il darwinismo cerca di spiegare l'esistenza della teleologia in natura facendo riferimento in modo vago alla selezione naturale. In questo articolo si precisa che la teoria darwiniana della selezione naturale può spiegare solo una specifica forma di teleologia, ossia quella causata da e di-

retta verso la preservazione del programma genetico. Il problema della teleologia viene affrontato in relazione alla discussione sulle unità di selezione. Secondo l'analisi di Dawkins l'unità di selezione è un replicatore dotato di un sufficiente grado di longevità-fecondità-fedeltà di copiatura. Per naturalizzare la teleologia occorrerebbe che l'unità di selezione comprendesse anche il programma genetico. Viene mostrato che nessuno dei candidati generalmente proposti quali unità di selezione può soddisfare contemporaneamente i requisiti indicati da Dawkins e quelli richiesti da una spiegazione naturalistica della teleologia.